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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference MSP617PCT1	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/04344	International filing date *(day/month/year)* 08.04.2003	Priority date *(day/month/year)* 10.04.2002
International Patent Classification (IPC) or both national classification and IPC H05H1/24		
Applicant DOW CORNING IRELAND LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

EPO - DG 1

14. 05. 2004

3. This report contains indications relating to the following items:

   (36)

   I ☒ Basis of the opinion
   II ☐ Priority
   III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   IV ☐ Lack of unity of invention
   V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   VI ☐ Certain documents cited
   VII ☐ Certain defects in the international application
   VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08.09.2003	16.04.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer de la Cal Heusch, E Telephone No. +49 89 2399-2008

Form PCT/IPEA/409 (Cover Sheet) (January 2004)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/04344

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-23 as originally filed

Claims, Numbers

1-19 as originally filed

Drawings, Sheets

1-3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-19
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-19
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-19
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Object

The object of the present invention is to efficiently obtain high quality metal oxide powder or gel, wherein the particle size, optical properties, etc, are uniform.

Solution

A liquid organometallic or organometalloid precursor is oxidated in a non-thermal plasma (or ionized gas steam resulting from such a plasma). Thereby the treatment temperature can be kept low and high quality, uniform metal oxides can be obtained.

Independent claims

Claim 1.

Prior art

D1: KARTHIKEYAN J ET AL: 'Plasma spray synthesis of nanomaterial powders and deposits' MATERIALS SCIENCE & ENGINEERING A (STRUCTURAL MATERIALS: PROPERTIES, MICROSTRUCTURE AND PROCESSING), 15 NOV. 1997, ELSEVIER, SWITZERLAND, vol. A238, no. 2, pages 275-286, XP002250516 ISSN: 0921-5093

D2: 'Synthesis of Nanosized Ceramic Oxide Powders by Microwave Plasma Reactions', D. Vollath and K.E. Sickafus, Nanostructured Materials 1 (5), p. 427-437 (1992).

Document D2 is cited in the introduction of D1 (Reference number 12).

D1 discloses a method of synthesis of nanosized ceramic oxide powders by atomising organometallic liquid precursors into a thermal plasma jet in order to obtain the corresponding metal oxide ceramic powder.

D2 discloses a method for synthesis of nanosized ceramic oxide powders by microwave plasma reactions, wherein a halide salt of the metal to be oxidized is vapourized within a Microwave non-thermal plasma with or without water injected through a nozzle to produce the respective ceramic metal oxide powders.

Assessment

Basically the difference of the subject-matter of claim 1 with respect to D1 is that here a non-thermal plasma is used instead of a thermal plasma and the difference with D2 is that here the precursor is a liquid organometallic or organometalloid (e.g. in form of atomised droplets) whereas in D2 it is a metal halide vapour.
Although D2 is cited in D1 there is no demonstrable obvious link of why the skilled person would combine the plasma reaction chamber of D2 with the liquid organometallic or organometalloid precursor injection system used in D1.

Final comments for further examination steps

During the present examination there was some discussion with the applicant if the term "non-thermal plasma" clearly delimits the scope of the application, since some doubts arose to the examiner if "non-thermal" plasmas can operate at atmospheric pressure (see claims 2 and 6). Although not completely clear and characterised, it seems in fact that atmospheric glow discharge plasmas have an electron temperature well above that of the ion and neutral temperature, therefore falling within the term "non-thermal plasma".
There was also discussion with respect the term "liquid precursor", since it seemed that in D2 the possibility of condensing the vaporized halid salts in the carrier gas (thereby forming a liquid precursor) is disclosed (see D2, p. 432, § 1). In fact, in view of the examiner, a vapour must not be a gas, but can be a suspension of e.g. liquid droplets.

The applicant has given however convincing arguments as to why the precursor of D2 is in the gas phase.

For the European Application

Independent claims should be in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

D2 should be cited in the description and briefly discussed.

The clarity of claim 3 should be improved: it seams that it should read "wherein the liquid precursor is retained in a container (see application, § 36, l. 26).